



US009261923B2

(12) **United States Patent**
Farrow et al.

(10) **Patent No.:** **US 9,261,923 B2**
(45) **Date of Patent:** **Feb. 16, 2016**

(54) **CARD RETENTION MECHANISM**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 6 days.

(21) Appl. No.: **14/229,889**

(22) Filed: **Mar. 29, 2014**

(65) **Prior Publication Data**

US 2015/0277511 A1 Oct. 1, 2015

(51) **Int. Cl.**

G06F 1/16 (2006.01)

G06F 1/18 (2006.01)

(52) **U.S. Cl.**

CPC **G06F 1/183** (2013.01)

(58) **Field of Classification Search**

USPC 713/300, 320, 153, 1, 323, 189, 2, 166,
713/340, 324; 361/690, 695, 679.4, 679.31,
361/679.02, 679.21, 679.39, 679.33,
361/679.48, 679.46, 679.59, 679.58,

361/679.49, 679.08, 679.32, 679.47,
361/679.57, 679.45, 679.5, 679.41; 439/62,
439/260, 66, 540.1, 296, 338, 492, 495;
345/173, 418, 419, 3.1, 501, 174, 619,
345/473, 161, 427.211; 455/457, 255, 424
See application file for complete search history.

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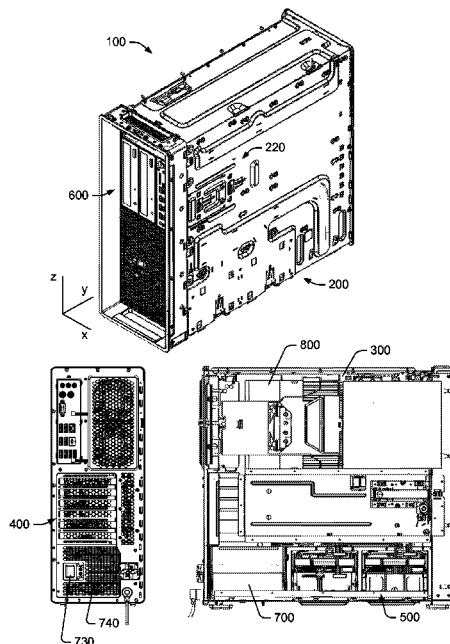
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(57) **ABSTRACT**

A system can include a chassis; a board operatively coupled to the chassis where the board includes card slots aligned along respective parallel planes and circuitry operatively coupled to the slots; a processor operatively coupled to the circuitry of the board; memory accessible by the processor; a bracket operatively coupled to the chassis where the bracket includes parallel recesses corresponding to the parallel planes; and a retainer operatively coupled to the bracket where the retainer includes parallel recesses where in an open orientation the parallel recesses of the retainer align with the parallel recesses of the bracket and where in a retention orientation the parallel recesses of the retainer misalign with the parallel recesses of the bracket. Various other apparatuses, systems, methods, etc., are also disclosed.

20 Claims, 12 Drawing Sheets



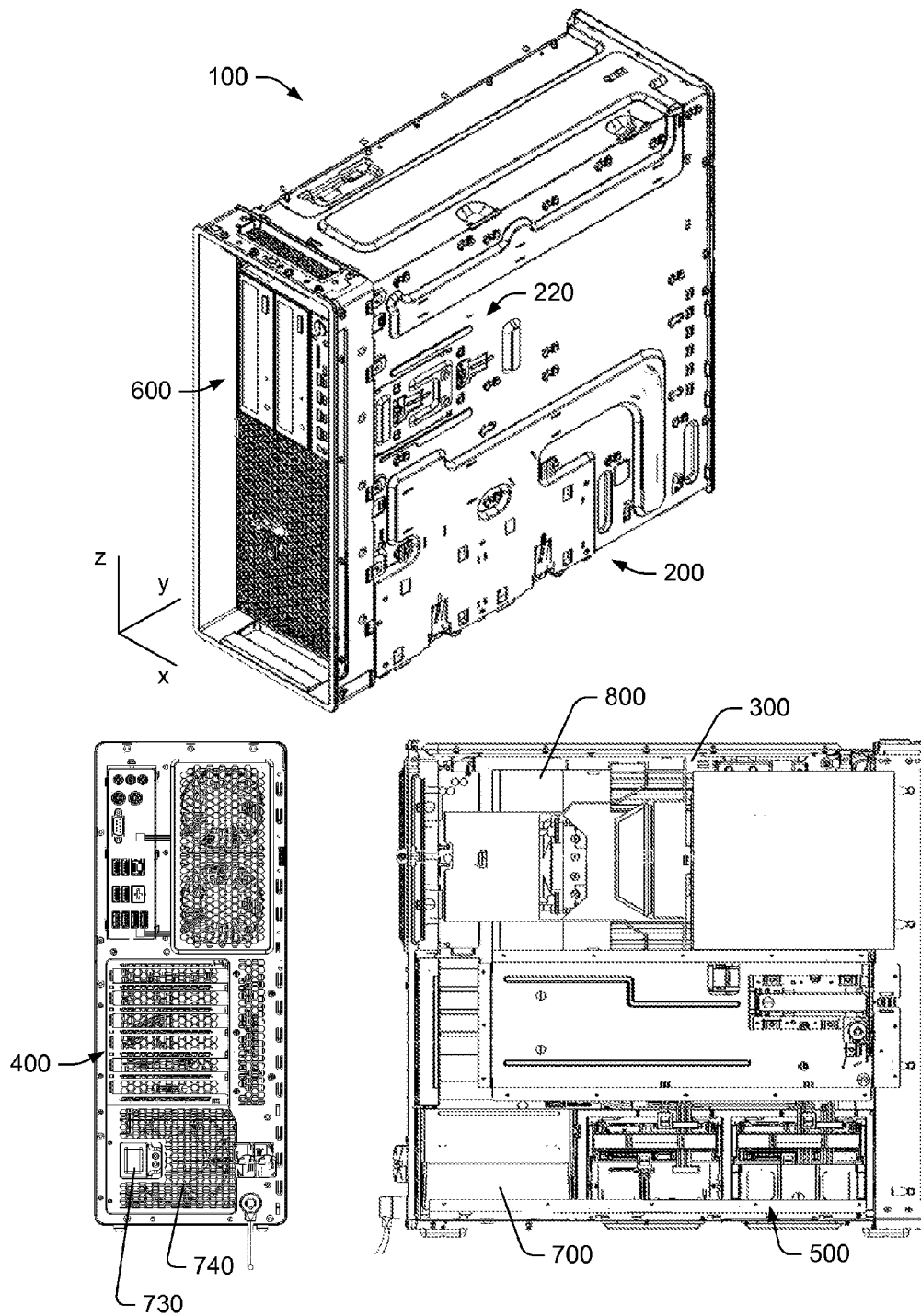


FIG. 1

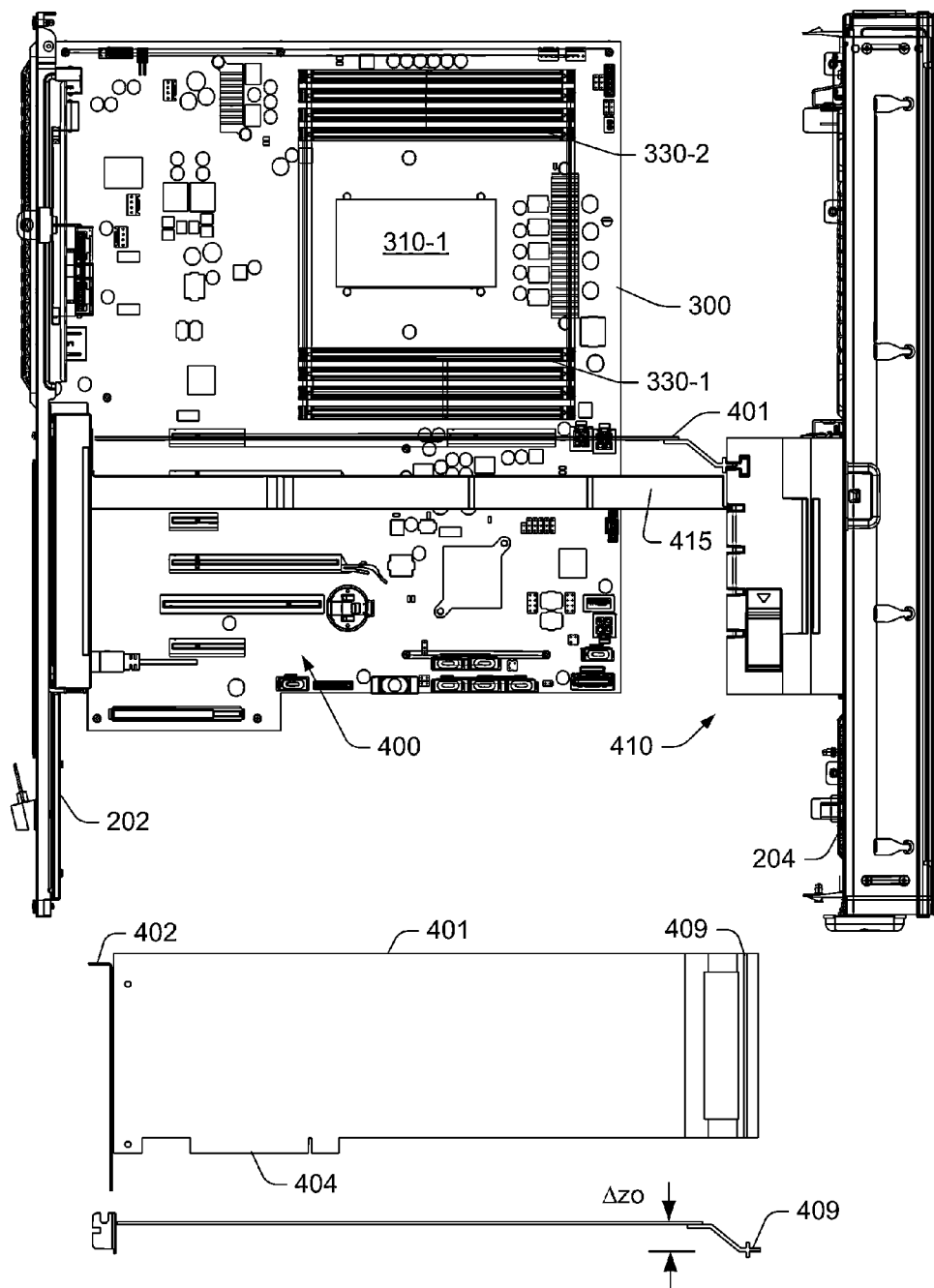


FIG. 2

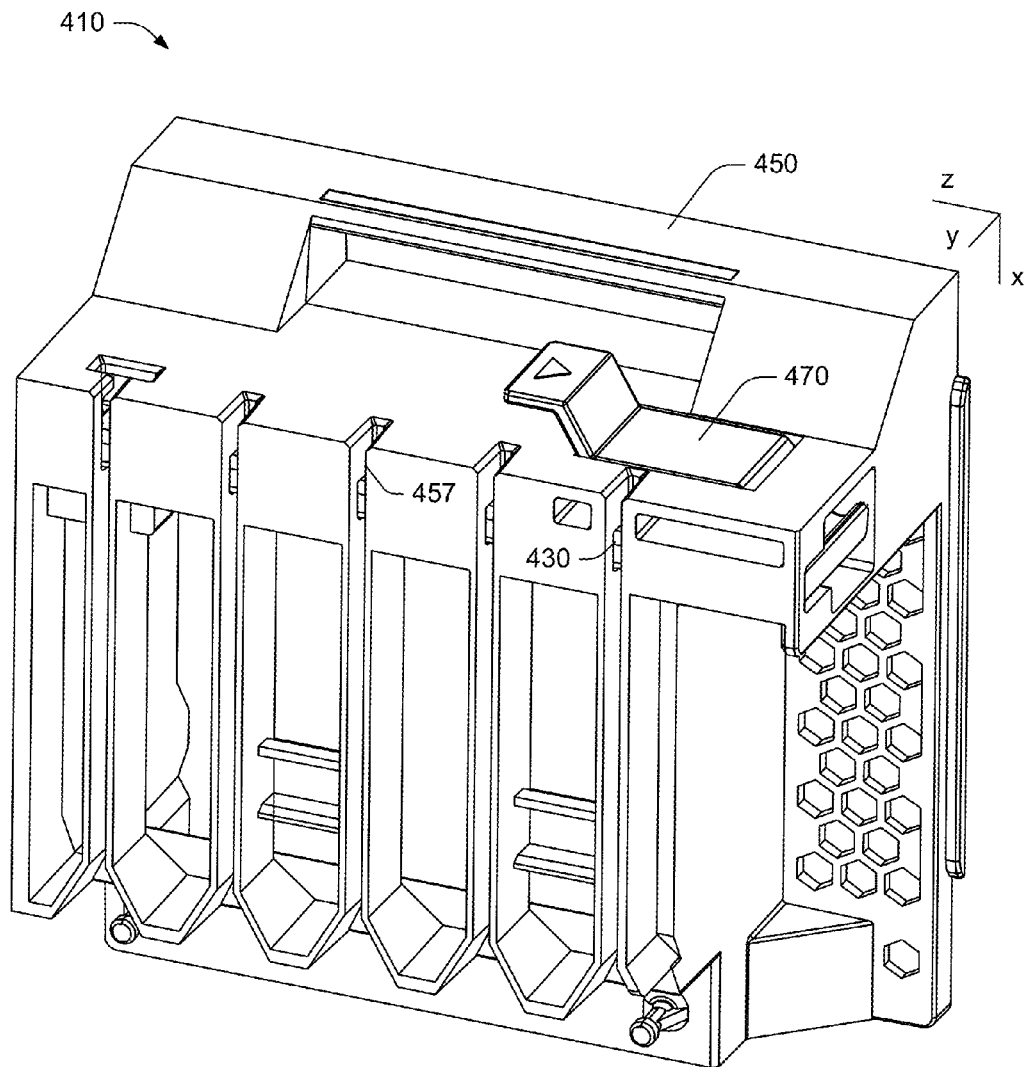


FIG. 3

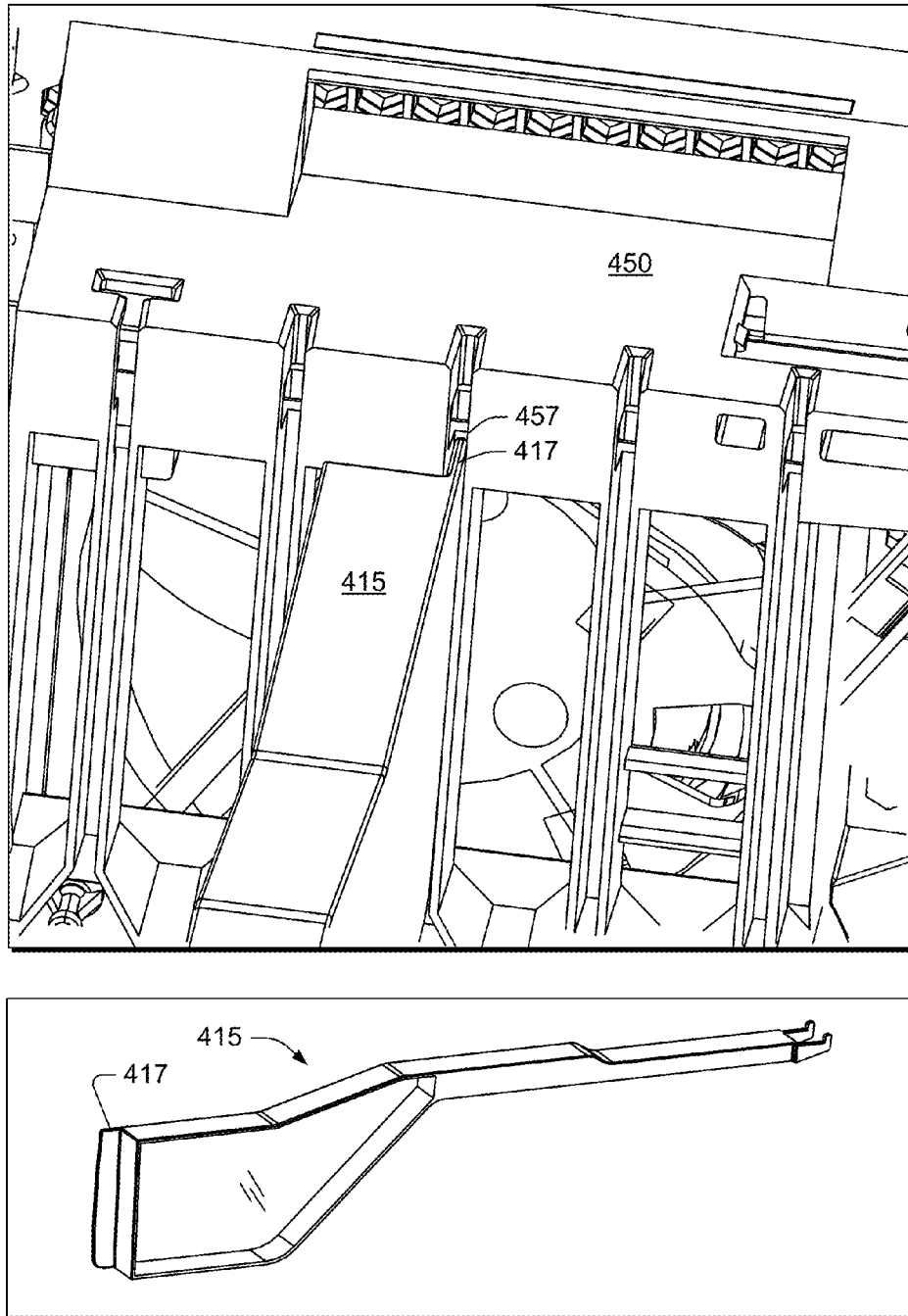


FIG. 4



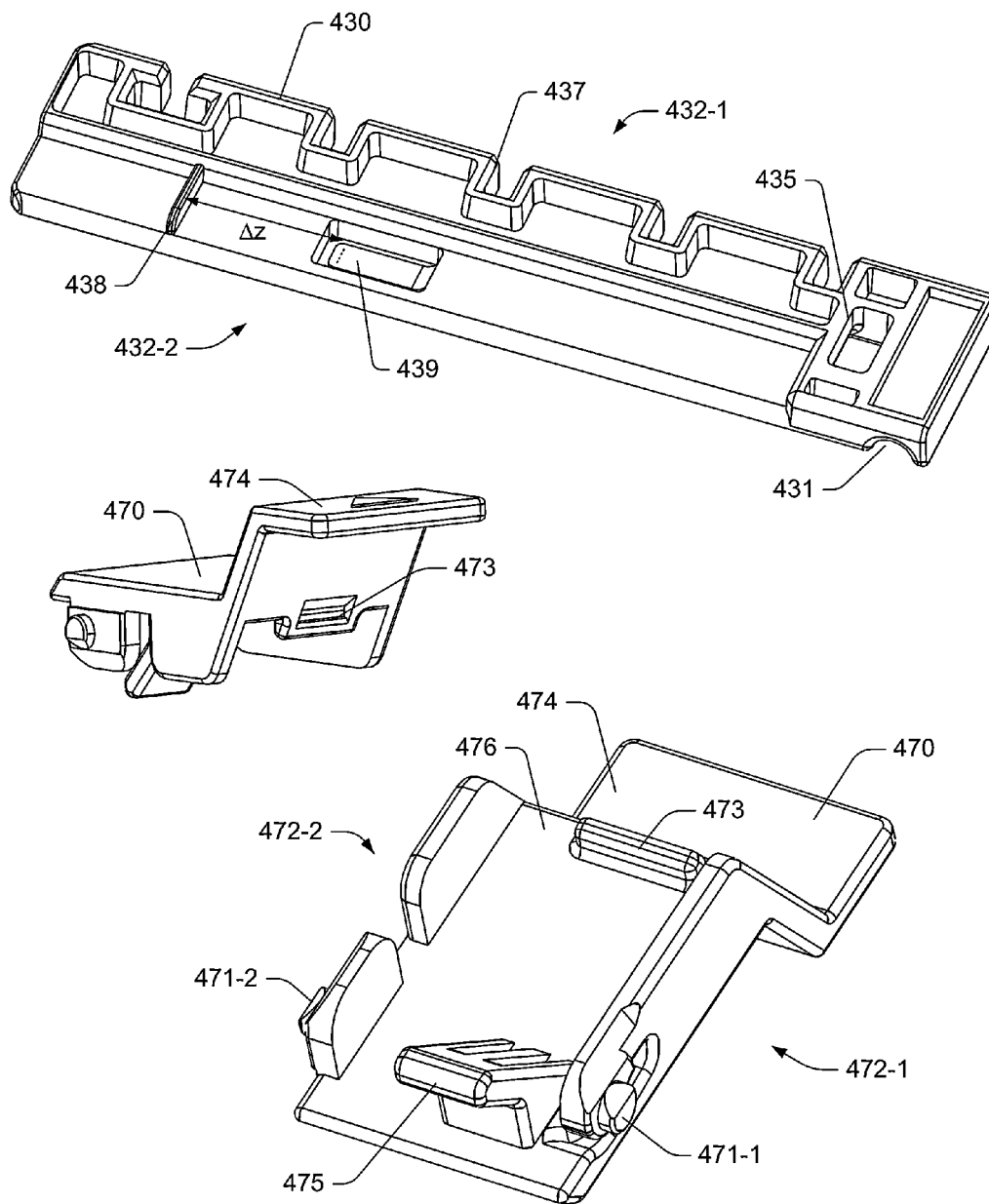


FIG. 6

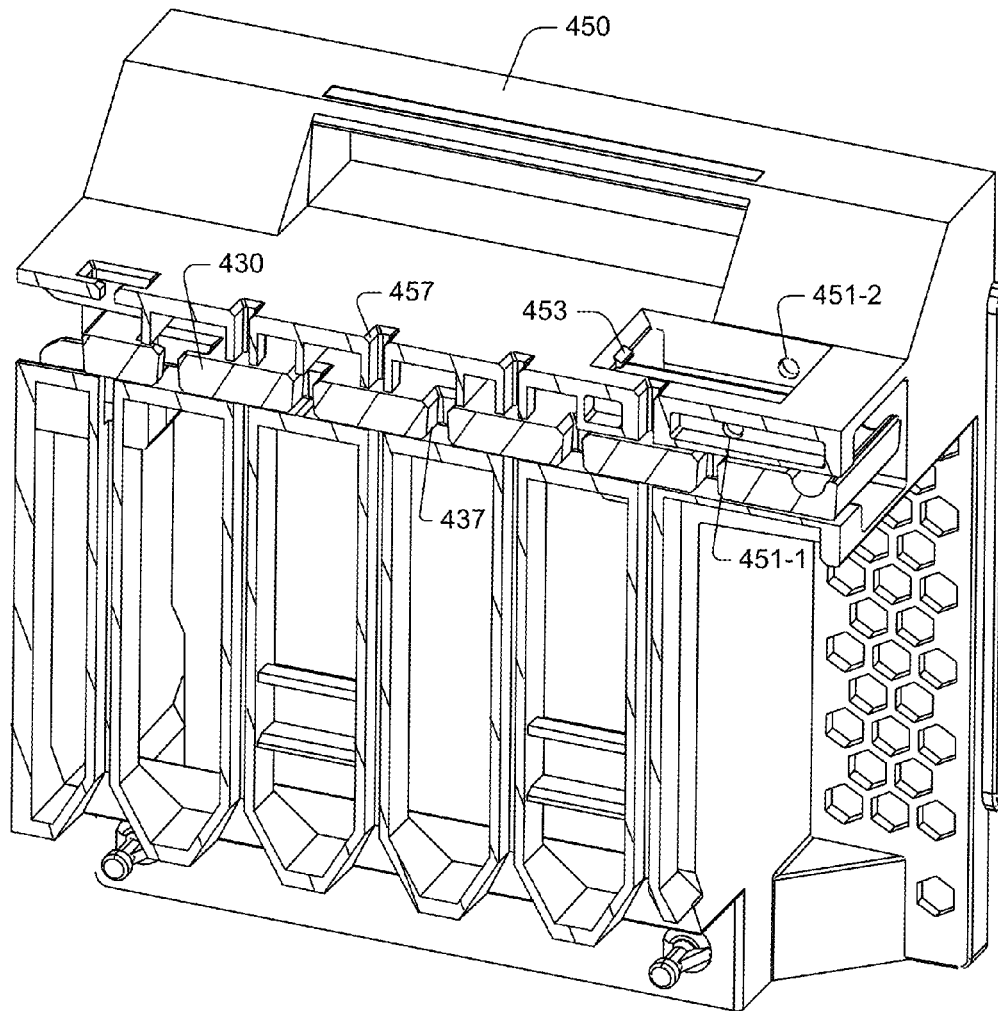


FIG. 7

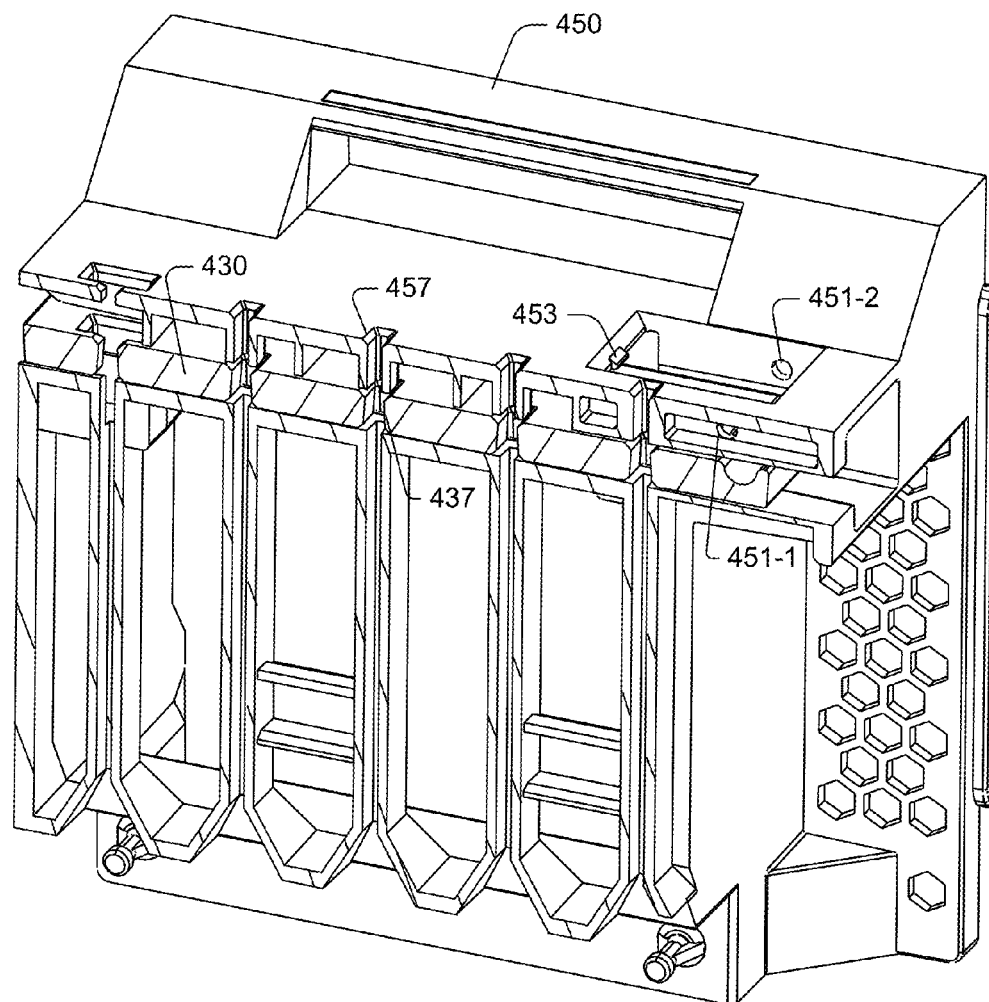


FIG. 8

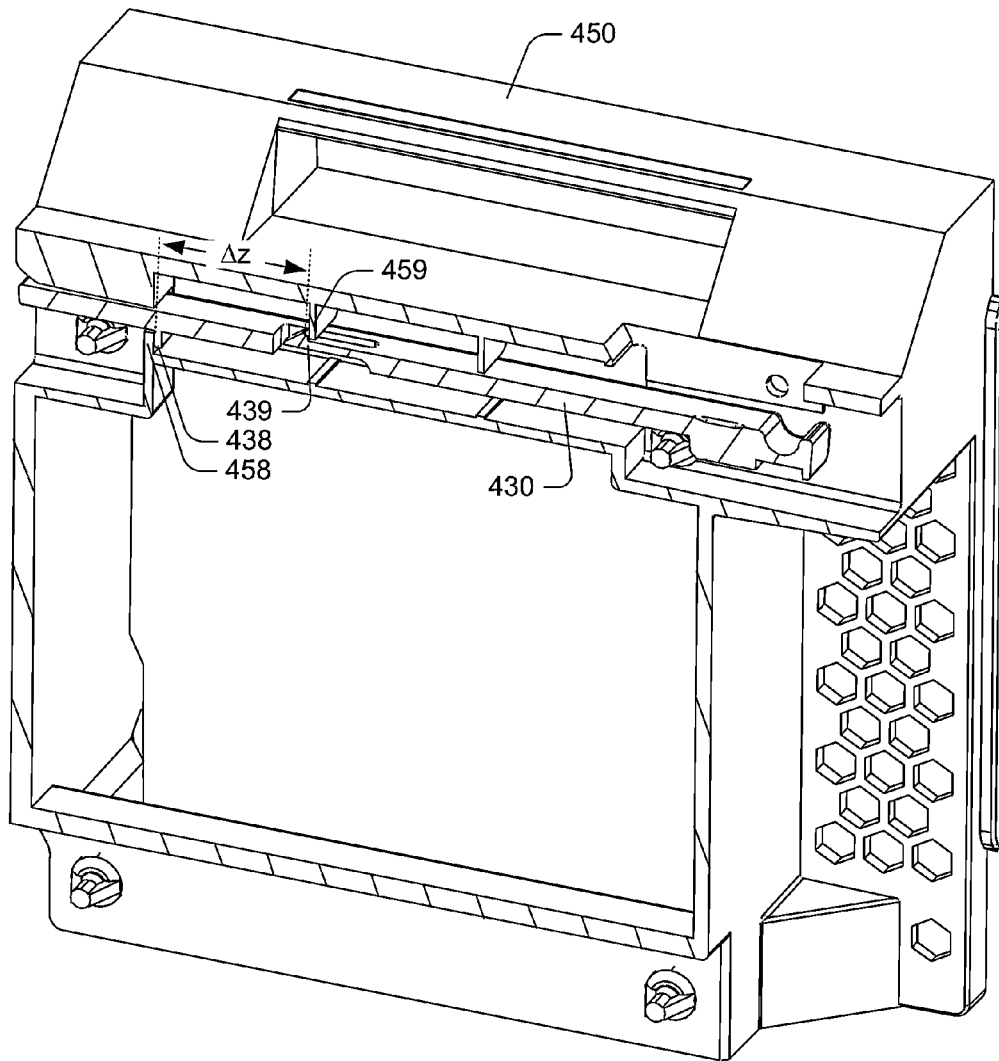


FIG. 9

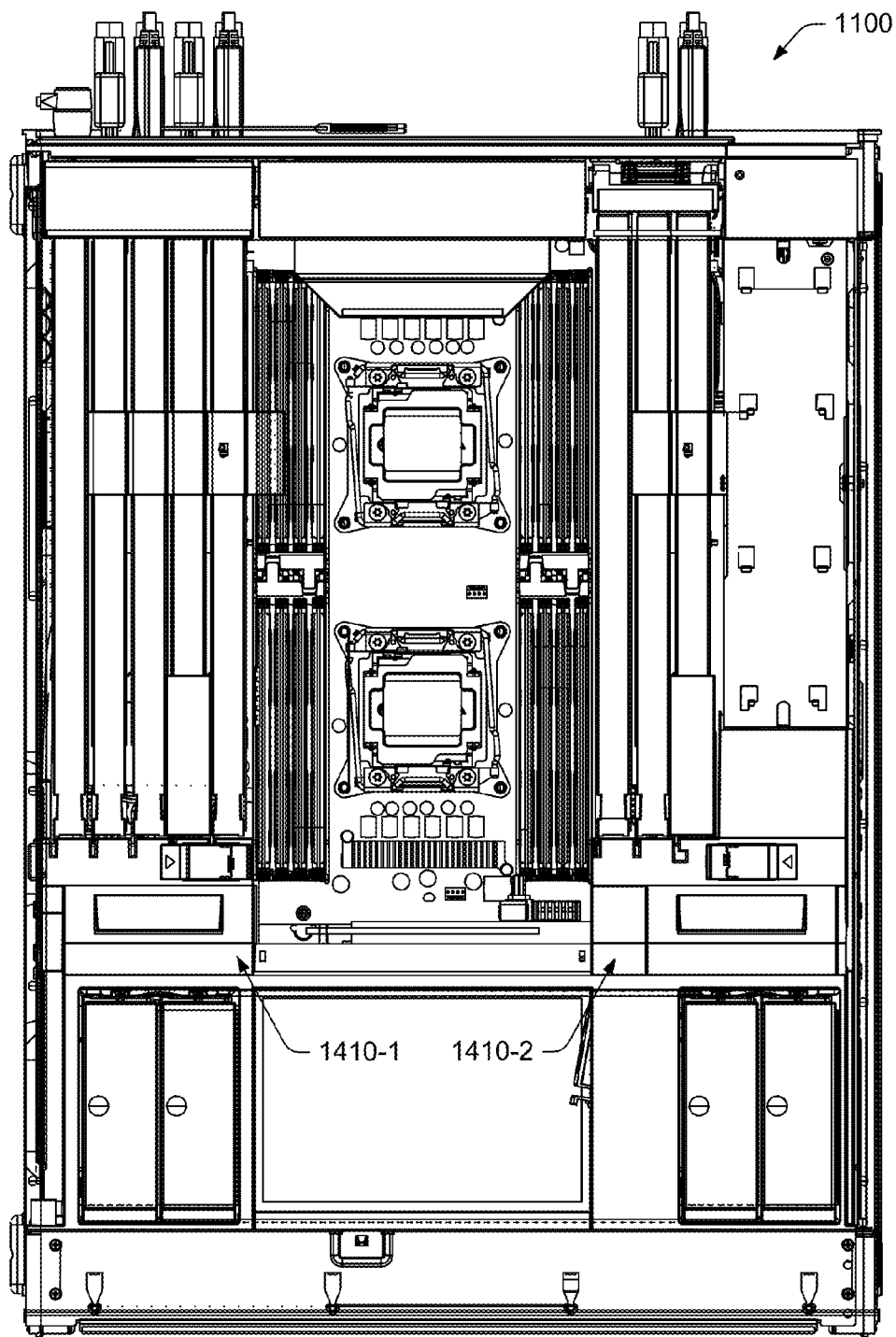


FIG. 10

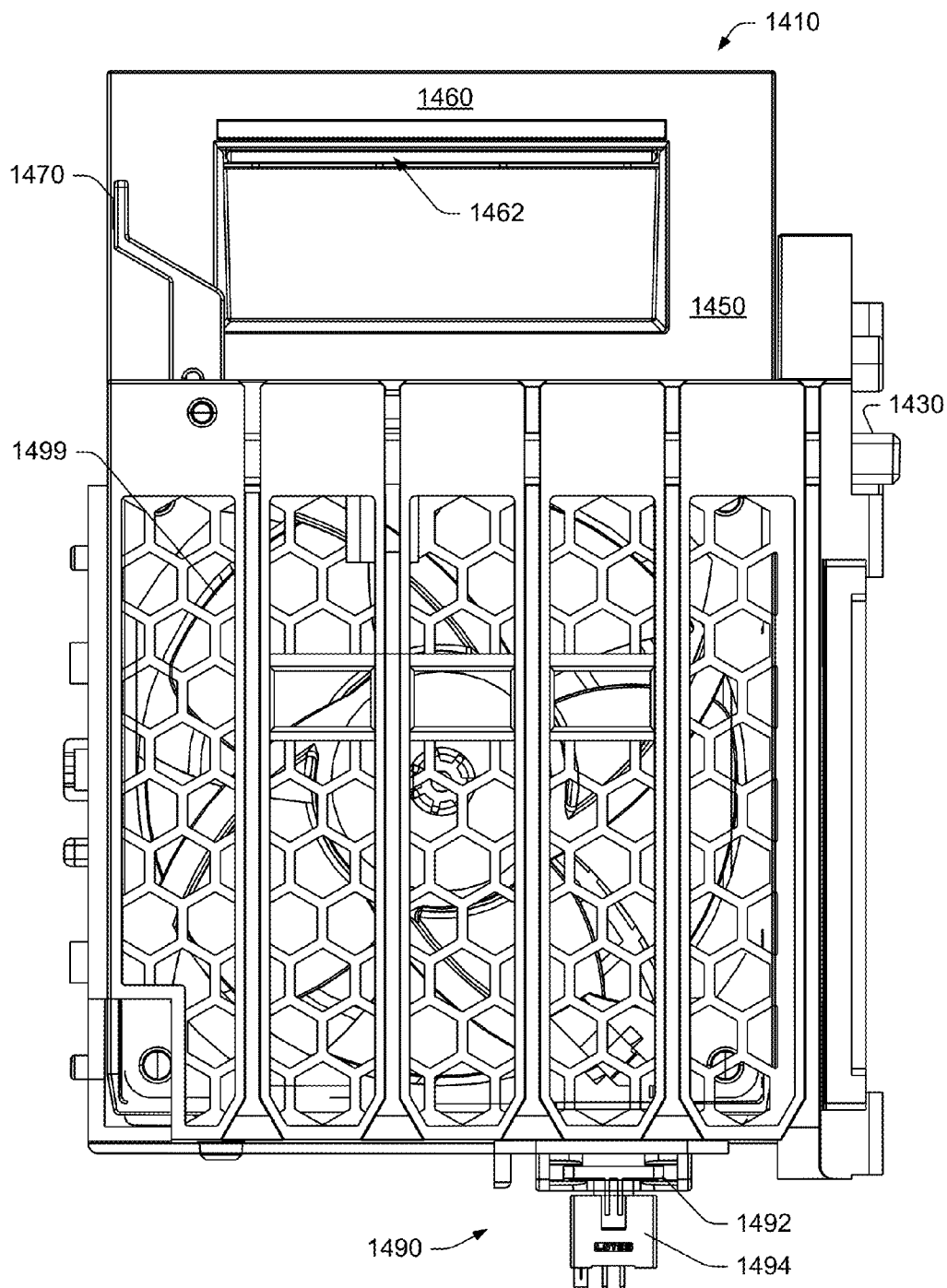


FIG. 11

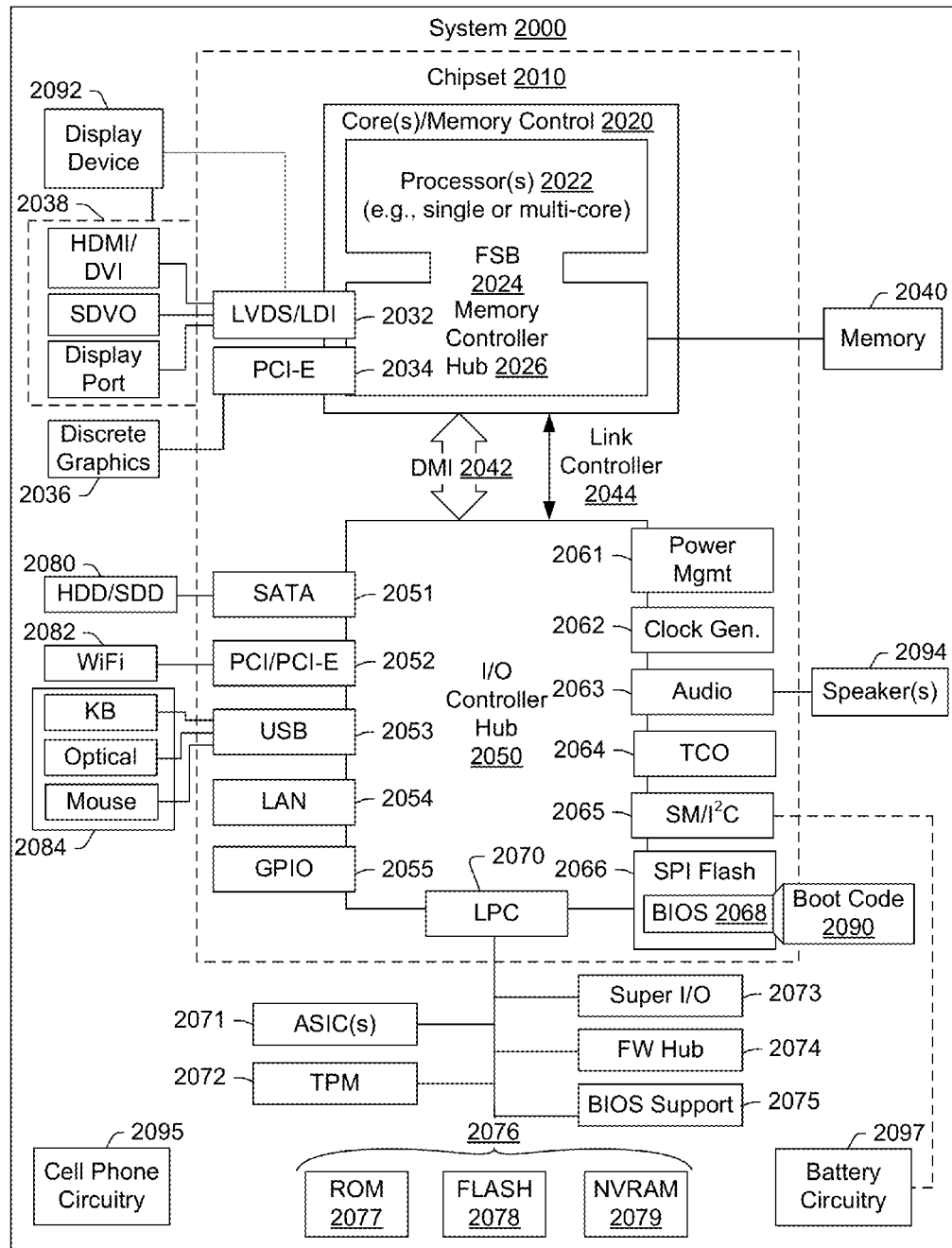


FIG. 12

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CARD RETENTION MECHANISM**TECHNICAL FIELD**

Subject matter disclosed herein generally relates to technology for a computing system.

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BACKGROUND

A computing system can include various components such as a processor, memory and one or more cards, for example, disposed in one or more card slots.

SUMMARY

A system can include a chassis; a board operatively coupled to the chassis where the board includes card slots aligned along respective parallel planes and circuitry operatively coupled to the slots; a processor operatively coupled to the circuitry of the board; memory accessible by the processor; a bracket operatively coupled to the chassis where the bracket includes parallel recesses corresponding to the parallel planes; and a retainer operatively coupled to the bracket where the retainer includes parallel recesses where in an open orientation the parallel recesses of the retainer align with the parallel recesses of the bracket and where in a retention orientation the parallel recesses of the retainer misalign with the parallel recesses of the bracket. Various other apparatuses, systems, methods, etc., are also disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the described implementations can be more readily understood by reference to the following description taken in conjunction with examples of the accompanying drawings.

FIG. 1 is a series of diagrams of views of an example of a computing system;

FIG. 2 is a series of diagrams that include a view of a portion of the computing system of FIG. 1 and a view of a card;

FIG. 3 is a diagram of a perspective view of an example of a card retention assembly;

FIG. 4 is a series of diagrams of perspective views of the card retention assembly of FIG. 3 with respect to an example of a card component;

FIG. 5 and FIG. 6 are a series of diagrams of views of various components of the card retention assembly of FIG. 3;

FIG. 7 and FIG. 8 are a series of diagrams of cutaway views of an example of the card retention assembly of FIG. 3;

FIG. 9 is a diagram of a cutaway view of an example of the card retention assembly of FIG. 3;

FIG. 10 is a diagram of an example of a computing system;

FIG. 11 is a diagram of an example of a card retention assembly that includes a fan unit; and

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FIG. 12 is a diagram of an example of circuitry of a system, a device, etc.

DETAILED DESCRIPTION

The following description includes the best mode presently contemplated for practicing the described implementations. This description is not to be taken in a limiting sense, but rather is made merely for the purpose of describing the general principles of the implementations. The scope of the invention should be ascertained with reference to the issued claims.

FIG. 1 shows an example of a computing system 100. As an example, the computing system 100 may be a workstation, for example, configured to handle information, which may include one or more of processing information, storing information, receiving information and transmitting information. The computing system 100 can include connectors 190, for example, to connect the computing system 100 to one or more peripherals, networks, etc. As an example, the computing system 100 may include wireless circuitry for wireless connection to one or more peripherals, networks, etc.

As shown in the example of FIG. 1, the computing system includes 100 includes a chassis 200, a board 300, slots 400, bays 500, bays 600, a power supply unit 700 and air flow features 800. As an example, a cover may be fitted to the chassis 200, which may include one or more panels. As an example, a panel may be a lockable panel where, in an unlocked state, it may be removed for access to various components in the computing system 100. As an example, various components may be configured for tool-less installation and removal. As an example, a tool-less configuration may include one or more handles, grips, buttons, levers, etc. that may be manipulated by one or more fingers of a human hand (e.g., or hands). As an example, a tool-less configuration may include guides, for example, for sliding in and sliding out components with respect to the chassis 200.

In the example of FIG. 1, the computing system 100 is shown with respect to a Cartesian coordinate system (x, y, z) and as including a back end and a front end disposed substantially in respective x,z-planes, a top end and a bottom end disposed substantially in respective x,y-planes and a left side and a right side disposed substantially in respective y,z-planes. As to an orientation with respect to gravity, as an example, the computing system 100 may be oriented on its bottom end where gravity may be aligned with the z-axis or, for example, the computing system 100 may be oriented on one of its sides where gravity may be aligned with the x-axis (e.g., with the left side facing upward and the right side facing downward).

In the example of FIG. 1, the chassis 200 includes a mechanism 220 for limiting movement of the board 300 (e.g., at least along the y-axis). As shown, the board 300 may be positioned substantially in a y,z-plane and may include various slots 400 for receipt of one or more components (e.g., cards, etc.), which may extend outwardly from the board 300 (e.g., at least in part along the x-axis).

As to the bays 500 and the bays 600, these may be defined at least in part by the chassis 200. As shown, the bays 500 and the bays 600 may include one or more bays accessible via the front end of the computing system 100 (see, e.g., the bays 600) and may include one or more bays accessible via one or both of the sides of the computing system 100 such as, for example, the left side of the computing system 1100 (see, e.g., the bays 500).

In the example of FIG. 1, the computing system 100 includes the power supply assembly 700, which includes a

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connector **730** for receipt of power (e.g., via a power cord) and which may include a fan **740** (e.g., or fans). The power supply assembly **700** may provide power to various components of the computing system **100**.

As shown in the example of FIG. 1, the chassis **200** includes various openings that may facilitate flow of air. In operation, the front end and the back end of the computing system **100** may be positioned with respective clearances from other environmental structures (e.g., shelves, desks, walls, equipment, etc.), for example, to not unduly hinder flow of air. Air flow through the computing system **100** may be guided by one or more of the air flow features **800**. As an example, the computing system **100** may include one or more baffles. As an example, the computing system **100** may include one or more fans. As an example, fans may be operated in series, for example, where air moved by one fan includes air moved by another fan. For example, a fan disposed in a first x,z-plane of the computing system **100** may move air at least in part along the y-axis (e.g., into the computing system **100**) where another fan disposed in a second x,z-plane of the computing system **100** receives at least a portion of that air and moves it at least in part along the y-axis (e.g., out of the computing system **100**). As mentioned, the power supply assembly **700** may include the fan **740** (e.g., or fans). In the example of FIG. 1, a fan **801** is shown as being disposed in an x,z-plane proximate to the back of the computing system **100**.

In the example of FIG. 1 the board **300** of the computing system **100** can include one or more processors **310-1** (e.g., and **310-2**, etc.) and memory **330-1** and **330-2** accessible by at least one of the one or more processors (e.g., **310-1**, **310-2**, etc.). One or more of the bays **500** and/or the bays **600** of the computing system **100** may include one or more storage devices, which may be accessible by at least one of the one or more processors.

FIG. 2 shows an example of a portion of the computing system **100** of FIG. 1. In the example of FIG. 2, portions of the chassis **200** are shown, including a back portion **202** and a front portion **204**. Various circuits or circuitry may be mounted to and/or integral to the board **300**. For example, in FIG. 2, the board **300** is shown as carrying the processor **310-1** and memory **330-1** and **330-2**.

As shown, the board **300** can include the slots **400** (e.g., at least a portion of a total number of slots of the computing system **100**). As an example, a portion of the slots **400** may be oriented in parallel. For example, where such slots are configured for receipt of respective cards, the slots may orient the cards in parallel planes (e.g., with spaces therebetween for air flow, etc.).

In the example of FIG. 2, a card **401** is shown as including a backplate **402** and a front mounting component **407** as well as an edge **404** that may be received via one of the slots **400** (e.g., an edge connector). As shown, a card retention assembly **410** may act to retain the card **401** and/or a card component **415**.

As an example, the card component **415** may be positioned in the portion of the computing system **100** as shown in FIG. 2. For example, consider the card component **415** as shown extending between the back portion **202** and the front portion **204** of the chassis **200** where the card component **415** is retained at least in part by the card retention assembly **410**.

As an example, a card and/or a card component may include an offset between a plane defined by a card or the card component and a front mounting component (e.g., or feature). For example, the card **401** is shown as including an offset (Δz_0) between the edge **404** and the front mounting component **407**. As an example, the card retention assembly **410** of

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FIG. 2 may be positioned to account for such an offset. For example, recesses of the card retention assembly **410** may be offset with respect to the slots **400** (e.g., offset in a z-direction). As an example, the card retention assembly **410** can include fewer or more recesses than slots. As an example, a computing system may include multiple card retention assemblies. As an example, a computing system may include one card retention assembly such as the assembly **410** with a first number of recesses and another card retention assembly such as the assembly **410** with a second number of recesses, which may differ from the first number of recesses.

As an example, a card or a card component may be operatively coupled to a chassis of a computing system at a back end of the card or the card component. In the example of FIG. 2, a card retention mechanism configured to retain back ends (e.g., backplates, etc.) may be operatively coupled to the chassis **200** (e.g., the back portion **202** of the chassis **200**).

As an example, slots may include card slots for cards such as, for example, PCI cards. As an example, a PCI card may be specified by a standard or standards. As an example, a maximum width of a PCI card may be about 15 mm (e.g., about 0.6 inches). As an example, a PCI card may be specified in part by height, for example, consider full-height and low-profile specifications. As an example, a card may include a backplate that may be configured to fasten the card to another component (e.g., a chassis, etc.), for example, to help stabilize the card. As to a backplate, it may be fixable using a screw such as, for example, a 6-32 or M3 screw. As an example, a card may include one or more external connectors.

As an example, a card may be specified in part by a length. For example, consider standards that specify full-length and half-length for full-height cards, and MD1 and MD2 for low-profile cards.

As an example, a slot may be a connector, for example, for electrically connecting circuitry of a card to circuitry of a board, etc. As an example, a PCI connector may be defined as including 62 contacts on each side of an edge connector where, for example, two or four contact positions are replaced by key notches. In such an example, a card may include 60 or 58 contacts on each side. In terms of numbering, a connector may use a "pin" based convention where, for example, pin **1** is closest to the backplate.

FIG. 3 shows an example of a card retention assembly **410** that includes a retainer **430**, a bracket **450** and a handle **470**. In such an example, the handle **470** is operatively coupled to the retainer **430** and the bracket **450** such that movement of the handle **470** moves the retainer **430** with respect to the bracket **450**. For example, the handle **470** may pivot with respect to the bracket **450** such that the retainer **430** slides with respect to the bracket **450**. In such a manner, the retainer **430** may be transitioned from an open orientation and a retention orientation.

FIG. 4 shows a perspective view of a portion of a computing system such as, for example, the computing system **100** of FIG. 1. In the example of FIG. 4, the bracket **450** is shown as including a recess **457** that can receive a portion **417** of a card component **415** (e.g., a front mounting component), which may be a component that may provide for, at least in part, mounting of a card in a slot. In the example of FIG. 4, the component **415** may be translated along an egress path (e.g., along a longitudinal axis of the recess), for example, in a plane defined by portion **417** of the component **415**. As an example, the retainer **430** may be inserted into the bracket **450** and positioned to block the egress path and thereby retain the component **415**. As mentioned, the handle **470** may be operatively coupled to the bracket **450** and used to move the retainer **430** between an open orientation and a retention

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orientation. In the open orientation, a card or a component may be inserted into the recess 457 or removed from the recess 457. While the card component 415 is shown, as an example, the front mounting component 407 of the card 401 of FIG. 2 may be received by the recess 457 of the bracket 450.

As an example, the bracket 450 may be configured to mount a fan unit. For example, the bracket 450 may include a frame portion that can receive a frame of a fan unit. In such an example, cards and/or card components that may be retained by a card retention mechanism that includes such a bracket may be exposed to airflow driven by operation of the fan unit. For example, air may flow between cards, card components, etc. in spaces that exist therebetween. As an example, cards may include respective edge connectors that are received by respective slots to thereby arrange the cards in parallel planes where spaces exist therebetween that may be airflow corridors. In such an example, where the cards and/or card components are retained by a card retention mechanism that can mount a fan unit or be mounted proximate to a fan unit, such a fan unit may drive air to flow in one or more of the airflow corridors (see also examples of FIG. 10 and FIG. 11).

FIG. 5 and FIG. 6 show various perspective views of the retainer 430 and the handle 470. As shown, the handle 470 may include one or more axels 471-1, 472-2, a first side wall 472-1, a second side wall 472-1, a keeper 473, a grip 474, a lever 475, and a base 476. For example, the first and second side walls 472-1 and 472-2 may extend from the base 476 and include extensions from which the axels 471-1 and 471-2 extend outwardly therefrom. As an example, one of the extensions may be configured to flex, for example, to facilitate insertion of the axels 471-1 and 471-2 into openings 451-1 and 451-2 of the bracket 450 (see, e.g., FIG. 7).

As shown in FIG. 5 and FIG. 6, the retainer 430 can include a grip 431, a first side 432-1, a second side 432-2, a socket 435, a recess 437, a stop 438 and a resilient tongue 439. The socket 435 of the retainer 430 may receive the lever 475 of the handle 470 such that movement of the handle 470 acts to move the retainer 430, for example, to position the recess 437 (e.g., noting that in the example of FIG. 5 and FIG. 6, the retainer 430 is shown as including five recesses).

As an example, the stop 438 may act to limit movement of the retainer 430 with respect to the bracket 450 (see, e.g., FIG. 9). For example, the stop 438 may contact a wall 458 of the bracket 450 (see, e.g., FIG. 9). As an example, the resilient tongue 439 may include an extension that may act as a catch with respect to the bracket 450 (see, e.g., FIG. 9). For example, the extension of the resilient tongue 439 may catch a wall 459 of the bracket 450 such that to move the retainer 430, force is applied to cause the resilient tongue 439 to deflect and thereby release the extension of the resilient tongue 439 from the wall 459. Such a mechanism may act to maintain the retainer 430 in the open orientation such that, for example, movement of a computing system does not cause the retainer 430 to move and alter clearances as to one or more recesses for insertion and/or removal of a card or card component. As an example, a computing system may be oriented with respect to gravity in one or more orientations and a card retention assembly of the computing system may include a mechanism that resists movement of a retainer of the card retention assembly where the retainer is in an open orientation (e.g., for insertion and/or removable of one or more cards, card components, etc.).

FIG. 7 and FIG. 8 show cutaway views of the retainer 430 and the bracket 450 of the card retention assembly 410 in a retention orientation (FIG. 7) and in an open orientation (FIG. 8). In the examples of FIG. 7 and FIG. 8, the retainer 430 may

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translate with respect to the bracket 450 (e.g., moving generally in a direction from left to right and right to left). As shown, translation of the retainer 430 causes the recess 437 of the retainer 430 to misalign with the recess 457 of the bracket 450 (e.g., retention orientation of FIG. 7) or to align with the recess 457 of the bracket 450 (e.g., open orientation of FIG. 8).

As shown in FIG. 7 and FIG. 8, the bracket 450 may include a latch 453 that extends from a wall of an opening that can receive at least a portion of the handle 470. In such an example, where the handle 470 includes the keeper 473, where the handle 470 is in a closed orientation with respect to the bracket 450, the latch 453 may be received by the keeper 473 such that a snap-fit force acts to maintain the handle 470 in the closed orientation. For example, the bracket 450 and the handle 470 may be made of polymeric material that may be resilient such that a snap-fit force may be achieved and, for example, overcome by a user gripping the handle portion 474 of the handle 470 and applying force to the handle portion 474 to pivot the handle 470 about its pivot axis to uncouple the keeper 473 from the latch 453.

As an example, the handle 470 may be operatively coupled to the bracket 450 in a manner that allows for some amount of flex at one or more of the axels 471-1 and 471-2. In such an example, the amount of flex may be sufficient to allow for coupling and uncoupling of the latch 453 and the keeper 473. While various examples refer to components that may be male or female in configuration, such components may optionally be rearranged. For example, the bracket 450 may include a keeper and the handle 470 may include a latch.

FIG. 9 shows a cutaway view of the retainer 430 and the bracket 450 of the card retention assembly 410. As mentioned, the stop 438 of the retainer 430 may contact a wall 458 of the bracket 450, which may limit motion of the retainer 430 with respect to the bracket 450 (e.g., generally to the left in FIG. 9). As mentioned, the resilient tongue 439 may include an extension that acts as a catch with respect to a wall 459 of the bracket 450. As an example, where the stop 438 contacts the wall 458, an extension of the resilient tongue 439 may catch on a wall 459. In such an example, the retainer 430 may resist movement of the retainer 430 with respect to the bracket 450 (e.g., generally to the right in FIG. 9). As an example, a dimension Δz may define a distance between the stop 438 and an extension of the resilient tongue 439 (see also FIG. 6). As an example, the bracket 450 may be configured for insertion of the retainer 430 without hindrance by the stop 438, for example, until the retainer 430 is inserted a distance whereby the stop 438 may contact the wall 458. As an example, the bracket 450 may include another wall such as the wall 459, for example, that acts to catch the retainer as it moves in a direction away from the wall 459 (e.g., generally to the right in FIG. 9). Once the resilient tongue 439 or other feature of the retainer 430 is past such a wall, the retainer may be removed from the bracket 450 (e.g., slide outwardly to the right).

FIG. 10 shows an example of a computing system 1100 that includes two card retention assemblies 1410-1 and 1410-2. In the example of FIG. 10, one or both of the card retention assemblies 1410-1 and 1410-2 may include a respective fan unit.

FIG. 11 shows an example of a card retention assembly 1410 that includes a retainer 1430, a bracket 1450 and a handle 1470 as well as a plug mechanism 1490. The plug mechanism 1490 can include a portion 1492 carried by the assembly 1410 and a portion 1494 that may be fixed to a board or other component of a computing system such as, for example, the computing system 1100 of FIG. 10.

As shown in the example of FIG. 11, the card retention assembly 1410 includes a fan unit 1499 operatively coupled thereto. For example, as shown in the cross-sectional view (e.g., cutaway view) of FIG. 9, a bracket 450 may form a frame that can receive a fan unit. Such a fan unit may include wires that couple to the plug mechanism 1490.

As an example, the card retention assembly 1410 may be carried by a handle portion 1460 of the bracket 1450 (e.g., with cross-member 1462) and positioned with respect to a computing system and, for example, translated to couple the portion 1492 of the plug mechanism 1490 carried by the assembly 1410 to the portion 1494 of the plug mechanism 1490 (e.g., as fixed to the computing system, etc.). Such a method of assembly may provide for a blind connection with respect to the plug mechanism 1490. As an example, one or more features of the assembly 1410 (e.g., guides of side walls, etc.) may cooperate with one or more features of a computing system to guide the assembly 1410 into the computing system in a manner whereby the plug mechanism 1490 may be coupled (e.g., to at least in part power the fan 1499).

As an example, a system can include a chassis; a board operatively coupled to the chassis where the board includes card slots aligned along respective parallel planes and circuitry operatively coupled to the slots; a processor operatively coupled to the circuitry of the board; memory accessible by the processor; and a card retention assembly operatively coupled to the chassis where the card retention assembly includes parallel recesses corresponding to the parallel planes and a fan unit. In such an example, the system may include a power supply unit, the card retention assembly may include a portion of a plug mechanism and another portion of the plug mechanism may be operatively coupled to the chassis and operatively coupled to the power supply unit. In such an example, the portions of the plug mechanism may be joined (e.g., coupled) such that power from the power supply unit can power the fan unit, which, in turn, may direct air toward the card slots (e.g., to cool one or more cards disposed in such card slots). As an example, a system may include a plurality of card retention assemblies where, for example, one or more may include a fan unit.

As an example, a method of assembly of a card retention assembly may include inserting a retainer into a cavity of a bracket and then coupling a handle to the bracket whereby a lever and a socket of the handle and the retainer are positioned with respect to each other from cooperative movement. As an example, a handle may snap-fit to a bracket, for example, via an axel that extends from a flexible wall. As an example, an assembled card retention assembly may be implemented in a tool-less manner for insertion and/or removal of a card or a card component (e.g., with respect to a computing system).

As explained with respect to FIG. 9, a retainer may be maintained in an orientation that allows for insertion and/or removal of one or more cards and/or card components. For example, a retainer may be maintained in a bracket in an open orientation such that the retainer does not move in a manner that would cause it to interfere with paths (e.g., egress paths) that would interfere with insertion and/or removal of one or more cards and/or card components with respect to the bracket. In such an example, upon application of force, a catch may release and allow the retainer to transition from the open orientation to a retention orientation. Such a card retention mechanism may allow for orienting a computing system with respect to gravity such that gravity does not cause movement of a retainer when the retainer is in an open orientation.

As an example, after assembly of a computing system such as, for example, the computing system 100 of FIG. 1, a card retention mechanism may be oriented in a retention orienta-

tion that retains cards and/or card components. Such a mechanism may help to ensure that movement of the computing system does not cause one or more cards and/or card components to become displaced from a proper position in the computing system. Where it is desirable to insert another card or card component, remove a card or card component, etc., the mechanism may be oriented to an open orientation whereby paths become open for ingress and/or egress of one or more cards and/or card components. As an example, a card may be an adapter card and, as an example, a card component may be an adapter card component.

As an example, a system can include a chassis; a board operatively coupled to the chassis where the board includes card slots aligned along respective parallel planes and circuitry operatively coupled to the slots; a processor operatively coupled to the circuitry of the board; memory accessible by the processor; a bracket operatively coupled to the chassis where the bracket includes parallel recesses corresponding to the parallel planes; and a retainer operatively coupled to the bracket where the retainer includes parallel recesses where in an open orientation the parallel recesses of the retainer align with the parallel recesses of the bracket and where in a retention orientation the parallel recesses of the retainer misalign with the parallel recesses of the bracket. In such an example, the parallel recesses of the bracket may be offset from the parallel planes.

As an example, recesses of a bracket may include recess shapes where at least one of the recess shapes differs from at least one other of the recess shapes. As an example, recesses of a retainer may include recess shapes where at least one of the recess shapes differs from at least one other of the recess shapes.

As an example, a card retention assembly may include a handle operatively coupled to a bracket and operatively coupled to a retainer. In such an example, the handle may operatively couple the retainer to the bracket. As an example, a handle may include an open orientation that positions a retainer in an open orientation and the handle may include a closed orientation that positions the retainer in a retention orientation. As an example, a handle may include axels that are received by openings of a bracket where, for example, the axels and openings define a pivot axis for pivotable movement of the handle with respect to the bracket. As an example, a handle and a bracket may include a latch mechanism that latches the handle in a closed orientation.

As an example, a handle may include a lever and a retainer may include a socket configured to receive at least a portion of the lever. In such an example, the handle may be a pivotable handle where pivoting of the pivotable handle moves the lever and translates the retainer with respect to the bracket.

As an example, an assembly may include a retainer that includes a stop and a bracket that includes a stop surface where contact between the stop and the stop surface limits translation of the retainer with respect to the bracket. As an example, an assembly may include a retainer that includes a catch where a bracket includes a catch surface where contact between the catch and the catch surface limits translation of the retainer with respect to the bracket. As an example, a retainer and a bracket may include a stop mechanism that, in the open orientation, limits movement of the retainer with respect to the bracket.

As an example, a bracket may include at least 2 recesses. As an example, a retainer may include at least 2 recesses. As an example, a board may include at least two slots. As an example, a bracket may include at least 2 recesses, a retainer may include at least 2 recesses and a board may include at least two slots.

As an example, a system can include a motherboard where a processor is mounted to the motherboard via a processor socket. As an example, a system may include a card disposed in one of a plurality of card slots. In such an example, the card slots may include one or more PCI card slots. In such an example, the system may include PCI cards disposed in PCI card slots.

The term “circuit” or “circuitry” is used in the summary, description, and/or claims. As is well known in the art, the term “circuitry” includes all levels of available integration, e.g., from discrete logic circuits to the highest level of circuit integration such as VLSI, and includes programmable logic components programmed to perform the functions of an embodiment as well as general-purpose or special-purpose processors programmed with instructions to perform those functions. Such circuitry may optionally rely on one or more computer-readable media that includes computer-executable instructions. As described herein, a computer-readable medium may be a storage device (e.g., a memory card, a storage disk, etc.) and referred to as a computer-readable storage medium. As an example, a computer-readable medium may be a computer-readable medium that is not a carrier wave.

While various examples of circuits or circuitry may be shown or discussed, FIG. 12 depicts a block diagram of an illustrative computer system **2000**. The system **2000** may be a computer system, such as one of the ThinkCentre® or ThinkPad® series of computers sold by Lenovo (US) Inc. of Morrisville, N.C., or a workstation computer, such as the ThinkStation® workstation computer sold by Lenovo (US) Inc. of Morrisville, N.C.; however, as apparent from the description herein, a satellite, a base, a server or other machine may include other features or only some of the features of the system **2000** (e.g., consider the ThinkServer® server sold by Lenovo (US) Inc. of Morrisville, N.C.).

As shown in FIG. 12, the system **2000** includes a so-called chipset **2010**. A chipset refers to a group of integrated circuits, or chips, that are designed to work together. Chipsets are usually marketed as a single product (e.g., consider chipsets marketed under the brands INTEL®, AMD®, etc.).

In the example of FIG. 12, the chipset **2010** has a particular architecture, which may vary to some extent depending on brand or manufacturer. The architecture of the chipset **2010** includes a core and memory control group **2020** and an I/O controller hub **2050** that exchange information (e.g., data, signals, commands, etc.) via, for example, a direct management interface or direct media interface (DMI) **2042** or a link controller **2044**. In the example of FIG. 12, the DMI **2042** is a chip-to-chip interface (sometimes referred to as being a link between a “northbridge” and a “southbridge”).

The core and memory control group **2020** include one or more processors **2022** (e.g., single core or multi-core) and a memory controller hub **2026** that exchange information via a front side bus (FSB) **2024**. As described herein, various components of the core and memory control group **2020** may be integrated onto a single processor die, for example, to make a chip that supplants the conventional “northbridge” style architecture.

The memory controller hub **2026** interfaces with memory **2040**. For example, the memory controller hub **2026** may provide support for DDR SDRAM memory (e.g., DDR, DDR2, DDR3, etc.). In general, the memory **2040** is a type of random-access memory (RAM). It is often referred to as “system memory”.

The memory controller hub **2026** further includes a low-voltage differential signaling interface (LVDS) **2032**. The LVDS **2032** may be a so-called LVDS Display Interface

(LDI) for support of a display device **2092** (e.g., a CRT, a flat panel, a projector, etc.). A block **2038** includes some examples of technologies that may be supported via the LVDS interface **2032** (e.g., serial digital video, HDMI/DVI, display port). The memory controller hub **2026** also includes one or more PCI-express interfaces (PCI-E) **2034**, for example, for support of discrete graphics **2036**. Discrete graphics using a PCI-E interface has become an alternative approach to an accelerated graphics port (AGP). For example, the memory controller hub **2026** may include a 16-lane (x16) PCI-E port for an external PCI-E-based graphics card. A system may include AGP or PCI-E for support of graphics. As described herein, a display may be a sensor display (e.g., configured for receipt of input using a stylus, a finger, etc.). As described herein, a sensor display may rely on resistive sensing, optical sensing, or other type of sensing.

The I/O hub controller **2050** includes a variety of interfaces. The example of FIG. 12 includes a SATA interface **2051**, one or more PCI-E interfaces **2052** (optionally one or more legacy PCI interfaces), one or more USB interfaces **2053**, a LAN interface **2054** (more generally a network interface), a general purpose I/O interface (GPIO) **2055**, a low-pin count (LPC) interface **2070**, a power management interface **2061**, a clock generator interface **2062**, an audio interface **2063** (e.g., for speakers **2094**), a total cost of operation (TCO) interface **2064**, a system management bus interface (e.g., a multi-master serial computer bus interface) **2065**, and a serial peripheral flash memory/controller interface (SPI Flash) **2066**, which, in the example of FIG. 12, includes BIOS **2068** and boot code **2090**. With respect to network connections, the I/O hub controller **2050** may include integrated gigabit Ethernet controller lines multiplexed with a PCI-E interface port. Other network features may operate independent of a PCI-E interface.

The interfaces of the I/O hub controller **2050** provide for communication with various devices, networks, etc. For example, the SATA interface **2051** provides for reading, writing or reading and writing information on one or more drives **2080** such as HDDs, SSDs or a combination thereof. The I/O hub controller **2050** may also include an advanced host controller interface (AHCI) to support one or more drives **2080**. The PCI-E interface **2052** allows for wireless connections **2082** to devices, networks, etc. The USB interface **2053** provides for input devices **2084** such as keyboards (KB), one or more optical sensors, mice and various other devices (e.g., microphones, cameras, phones, storage, media players, etc.). On or more other types of sensors may optionally rely on the USB interface **2053** or another interface (e.g., I²C, etc.).

In the example of FIG. 12, the LPC interface **2070** provides for use of one or more ASICs **2071**, a trusted platform module (TPM) **2072**, a super I/O **2073**, a firmware hub **2074**, BIOS support **2075** as well as various types of memory **2076** such as ROM **2077**, Flash **2078**, and non-volatile RAM (NVRAM) **2079**. With respect to the TPM **2072**, this module may be in the form of a chip that can be used to authenticate software and hardware devices. For example, a TPM may be capable of performing platform authentication and may be used to verify that a system seeking access is the expected system.

The system **2000**, upon power on, may be configured to execute boot code **2090** for the BIOS **2068**, as stored within the SPI Flash **2066**, and thereafter processes data under the control of one or more operating systems and application software (e.g., stored in system memory **2040**). An operating system may be stored in any of a variety of locations and accessed, for example, according to instructions of the BIOS **2068**. Again, as described herein, a satellite, a base, a server or other machine may include fewer or more features than

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shown in the system **2000** of FIG. **12**. Further, the system **2000** of FIG. **12** is shown as optionally including cell phone circuitry **2095**, which may include GSM, CDMA, etc., types of circuitry configured for coordinated operation with one or more of the other features of the system **2000**.

CONCLUSION

Although examples of methods, devices, systems, etc., have been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as examples of forms of implementing the claimed methods, devices, systems, etc.

What is claimed is:

1. A system comprising:
a chassis;
a board operatively coupled to the chassis wherein the board comprises card slots aligned along respective parallel planes and circuitry operatively coupled to the slots;
a processor operatively coupled to the circuitry of the board;
memory accessible by the processor;
a bracket operatively coupled to the chassis wherein the bracket comprises parallel recesses corresponding to the parallel planes; and
a retainer operatively coupled to the bracket wherein the retainer comprises parallel recesses wherein in an open orientation the parallel recesses of the retainer align with the parallel recesses of the bracket and wherein in a retention orientation the parallel recesses of the retainer misalign with the parallel recesses of the bracket.
2. The system of claim 1 wherein the parallel recesses of the bracket are offset from the parallel planes.
3. The system of claim 1 wherein the recesses of the bracket comprise recess shapes and wherein at least one of the recess shapes differs from at least one other of the recess shapes.
4. The system of claim 1 wherein the recesses of the retainer comprise recess shapes and wherein at least one of the recess shapes differs from at least one other of the recess shapes.
5. The system of claim 1 comprising a handle operatively coupled to the bracket and operatively coupled to the retainer.
6. The system of claim 5 wherein the handle comprises an open orientation that positions the retainer in the open orientation and wherein the handle comprises a closed orientation that positions the retainer in the retention orientation.
7. The system of claim 5 wherein the handle comprises axels that are received by openings of the bracket wherein the axels and openings define a pivot axis for pivotable movement of the handle with respect to the bracket.

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8. The system of claim 5 wherein the handle and the bracket comprise a latch mechanism that latches the handle in a closed orientation.

9. The system of claim 5 wherein the handle comprises a lever and wherein the retainer comprises a socket configured to receive at least a portion of the lever.

10. The system of claim 9 wherein the handle comprises a pivotable handle wherein pivoting of the pivotable handle moves the lever and translates the retainer with respect to the bracket.

11. The system of claim 1 wherein the retainer comprises a stop and wherein the bracket comprises a stop surface wherein contact between the stop and the stop surface limits translation of the retainer with respect to the bracket.

12. The system of claim 1 wherein the retainer comprises a catch and wherein the bracket comprises a catch surface wherein contact between the catch and the catch surface limits translation of the retainer with respect to the bracket.

13. The system of claim 1 wherein the retainer and the bracket comprise a stop mechanism that, in the open orientation, limits movement of the retainer with respect to the bracket.

14. The system of claim 1 wherein the bracket comprises at least 2 recesses.

15. The system of claim 1 wherein the retainer comprises at least 2 recesses.

16. The system of claim 1 wherein the board comprises at least two slots.

17. The system of claim 1 wherein the board comprises a motherboard wherein the processor is mounted to the board via a processor socket.

18. The system of claim 1 comprising a card disposed in one of the card slots.

19. A system comprising:
a chassis;
a board operatively coupled to the chassis wherein the board comprises card slots aligned along respective parallel planes and circuitry operatively coupled to the slots;
a processor operatively coupled to the circuitry of the board;
memory accessible by the processor; and
a card retention assembly operatively coupled to the chassis wherein the card retention assembly comprises parallel recesses corresponding to the parallel planes and wherein the card retention assembly comprises a fan unit.

20. The system of claim 19 wherein the system comprises a power supply unit and wherein the card retention assembly comprises a portion of a plug mechanism and wherein another portion of the plug mechanism is operatively coupled to the chassis and operatively coupled to the power supply unit.

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